Zootaxa 3245: 54–62 (2012)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Pseudopataecus carnatobarbatus, a new species of velvetfish (Teleostei: Scorpaeniformes: Aploactinidae) from the Kimberley coast of Western Australia

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Abstract

Pseudopataecus carnatobarbatus, new species, is described from 12 specimens collected on shallow coastal reefs of northern Western Australia, between the Monte Bello Islands and Adele Island. It is distinguished from its sole congener, *P. taenianotus* Johnson 2004, by branched (versus simple) tips to most fin rays, last soft dorsal-fin ray joined by membrane more fully to upper caudal-fin ray, spinous dorsal fin more distinctly notched, pelvic fins more robust, anterior face of lower lip smooth (versus profusely covered with cirri), and a narrow quadrangular pit on the forehead, bounded by frontal, supraorbital, ocular and preocular ridges (versus pit and preocular ridge absent). It also has modally fewer anal-fin rays and modally greater numbers of gill rakers. *Pseudopataecus carnatobarbatus* is found in an extremely high tidal range area of Australia, where movement of up to 11 m occurs during spring tides. Specimens were collected in rocky tide pools with coral rubble and thick stands of brown macroalgae, especially *Padina* species. The new species has been found in intertidal areas up to only 13 m deep, whereas *P. taenianotus* has been collected by trawling soft bottom habitats in depths of 20 to 63 m.

Key words: *Pseudopataecus carnatobarbatus*, new species, Aploactinidae, velvetfish, Western Australia, Kimberley coast

Introduction

The genus *Pseudopataecus* was previously represented by a single species, *P. taenianotus*, known only from specimens trawled inside the Capricorn-Bunker Group of subtropical Queensland (Johnson 2004; Hoese *et al*. 2006). That species appears to be restricted to a narrow range of soft-bottom habitats in an area of the Queensland coast covering a distance of approximately 100 nautical miles from north to south.

Examination of unidentified aploactinid specimens from Monte Bello Islands and Cape Leveque, Western Australia, in the collections of the Museum and Art Gallery of the Northern Territory, revealed the existence of a second species with features unique to *Pseudopataecus* (markedly compressed head and body; large number of dorsal and anal-fin ray elements; frontal part of cranium with laterally-bowed ridges forming a shallow fleshy depression; and distinctly anterior insertion of the first dorsal spine). Additional specimens of the new species were collected and observed during a recent marine faunal survey of the Kimberley region. The Woodside Collection Project – Kimberley (Woodside 4) was undertaken to document fishes and other marine fauna and flora of the reef systems of the inshore Kimberley. In October 2009 collections made in tidal rock pools at Adele Island and Montgomery Reef produced an additional nine specimens from five separate sites. Several individuals were also observed at high tide at the same localities whilst scuba diving in depths of up to 10 m. The new species is described and illustrated herein and compared in detail to its congener.

The Aploactinidae (velvetfishes) now comprises 48 species belonging to 17 genera (Poss & Eschmeyer 1978; Fricke 2004; Johnson 2004; Imamura & Shinohara 2004, 2008; Poss 1999; Hoese *et al*. 2006; Imamura *et al*. 2010; Prokofiev 2010; Eschmeyer & Fricke 2012). Twenty-one species in 14 genera are now known from Australian waters (Johnson 2004; Hoese *et al*. 2006; this paper).

 Accepted by R. Pethiyagoda: 15 Feb. 2012; published: 23 Mar. 2012

Materials and methods

Methods for counts and measurements follow Eschmeyer (1969) and Johnson (2004). The last rays of the dorsal and anal fins appear separate, but are borne on the same pterygiophore as the penultimate element, so each pair is counted as one. Radiographs were used to determine vertebral numbers and to confirm caudal and unpaired fin ray counts. Measurements were taken using digital calipers, with the aid of a stereo microscope where necessary. Specimen lengths are standard lengths (SL) in mm. Head length is abbreviated as HL. Where different, values for paratypes follow those of the holotype in parentheses. Meristic and morphometric details for the new taxon are presented in Tables 1–2. Institutional codes follow Leviton et al. (1985).

Pseudopataecus carnatobarbatus sp. nov.

Goatee Velvetfish
(Fig. 1A–C, 2A–B, 3; Table 1–2)

Holotype. WAM P. 33274-001, 97.4 mm, Adele Island, reef platform at head of Frazer channel, 15º 29.474'S 123º 09.798'E, rotenone 0–1 m, S. Morrison, J. Johnson, 15 Oct 2009 (tissue sample taken).

Paratypes. AMS I.45620-001 (ex WAM P.33291-001), 72.9 mm, Montgomery Reef, small tidal pools, 15º53.7'S 124º20.34'E, 0–0.5 m, rotenone, S. Morrison, J. Johnson, 24 Oct 2009; NTM S.10805-015, 65.5 mm, Near Alpha Island, Monte Bello Islands, 20º24'S 115º32'E, 3–9 m, H. Larson, R. Williams, 22 Apr 1983, sand, coral rubble, Sargassum, coral; NTM S.12587-055, 2: 51.0–57.1 mm, juveniles, East side of Cape Leveque, 16º25'S 122º55'E, 0–0.5 m, H. Larson, 18 Mar 1987; QM I.38821 (ex WAM P.33273-001), 75.0 mm, Adele Island, tidal pools, 15º31.7'S 123º11.611'E, 0–1 m, rotenone, S. Morrison, J. Johnson, 14 Oct 2009; QM I.38822 (ex WAM P.33291-001), 59.2 mm, juvenile, Montgomery Reef, small tidal pools, 15º53.7'S 124º20.34'E, 0–0.5 m, rotenone, S. Morrison, J. Johnson, 24 Oct 2009; WAM P.33273-001, 36.1 mm, juvenile, Adele Island, tidal pools, 15º31.7'S 123º11.611'E, 0–1 m, rotenone, S. Morrison, J. Johnson, 14 Oct 2009; WAM P.33274-003 (ex WAM P. 33274-001), 71.6 mm, same data as holotype (tissue sample taken); WAM P.33276-001, 84.5 mm, Adele Island, NW corner of reef, 15º27.744'S 123º06.201'E, 6.6 m, hand collected, C. Bryce, 17 Oct 2009; WAM P.33278-001, 71.5 mm, Montgomery Reef, steep fore-reef with channels, 15º53.815'S 124º19.531'E, 0–1 m, rotenone, S. Morrison, J. Johnson, 19 Oct 2009; WAM P.33291-001, 73.3 mm, Montgomery Reef, small tidal pools, 15º53.7'S 124º20.34'E, 0–0.5 m, rotenone, S. Morrison, J. Johnson, 24 Oct 2009.

Diagnosis. A species of *Pseudopataecus* with dorsal-fin rays XIII–XIV, 13i–14i; anal-fin rays I, 9i–11i; pectoral-fin rays 11–12; pelvic-fin rays I, 3; gill rakers 0–4 + 5–8, total 6–11 on first arch; lateral-line tubes 13–17; vertebrae, including urostyle, 31–32. Dorsal-, anal-, pectoral-, first two pelvic- and most caudal-fin rays branched near their tips, except in juveniles; last soft dorsal-fin ray joined for most of its length by membrane to proximal third of upper caudal-fin ray; spinous dorsal fin strongly notched between third and eighth spines; pelvic fins relatively robust, with third or innermost ray subequal to second ray; anterior face of lower lip smooth, with a single row of small unbranched cirri along its upper margin; a narrow quadrangular pit on forehead bounded by frontal, supraorbital, ocular and preocular ridges.

Description. Head 2.9 (2.7–3.0) in SL, markedly compressed and covered with modified scales ending in spinous points; scales absent or less dense on snout and interorbital space. Dorsal profile of head convex, ascending steeply to base of extremely anteriorly inserted dorsal fin, inclined dorsoposteriorly about 50° from horizontal. Eye 5.1 (3.4–4.7) in HL, smaller relative to HL in larger specimens. Lachrymal spines connected at base, with broad blunt points, first directed anteroventrally over maxilla, second longer and narrower, directed dorsoposteriorly. Surface of lachrymal bone lacking bony knob-like projections. Suborbital ridge with four knob-like spines, anterior two small, posterior two larger, connecting to form a bony ridge. Frontal ridges prominent, thinly covered with skin, slightly bowed at midlength, then gently converging posteriorly to meet a flat transverse bony boss anterior to base of first dorsal spine; ridges forming a distinct fleshy pit in their interspace. Tip of rostral cartilage from ascending premaxillary processes evident by a raised bump preceding the pit. A tuft of simple to poorly branched cirri at anterior end of each ridge and a simple cirrus posteriorly at the outside edge of each ridge. Supraorbital spine followed anteriorly by a prominent flange-like ridge, curving anteriorly to base of first dorsal-fin spine and converging with non-prominent bony ridge across posterior end of frontal ridges; a second parallel ridge below,

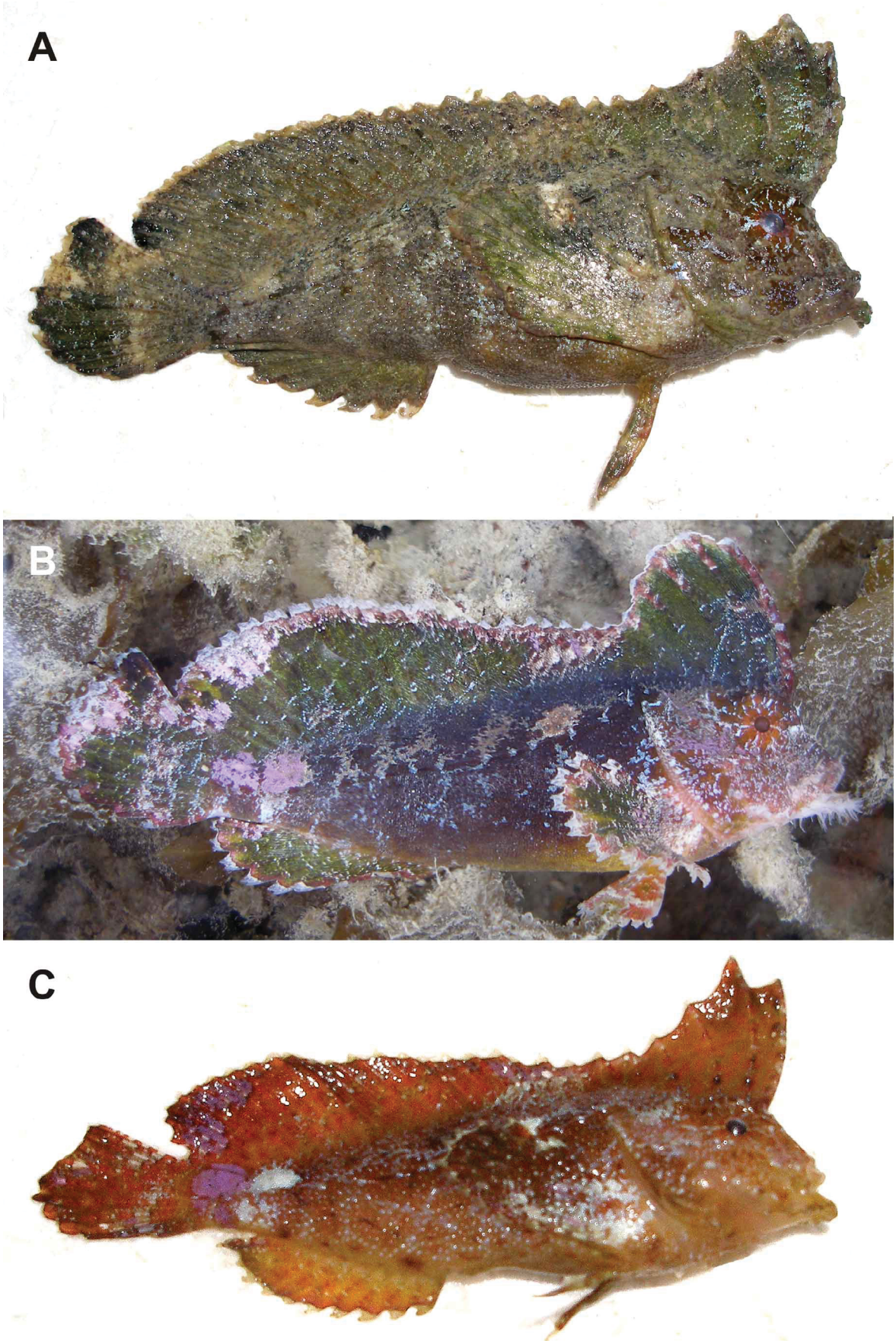

FIGURE 1. Types of *Pseudopataecus carnatobarbatus*. (A) Holotype, WAM P.33274-001, 97.4 mm (fresh); (B) Paratype, WAM P.33291-001, 73.3 mm (in situ); (C) Paratype, WAM P.33273-001, 36.1 mm (fresh). (Photos: S. Morrison)

produced from preocular spine and extending from ocular to frontal ridges, forming a moderately deep quadrangular pit in the interspace (Fig. 2A–B). No spines on nasals. Anterior nostril a simple tube midway between eye and tip of snout. Posterior nostril just anterior to middle of eye, a less prominent open tube with anterior margin raised.

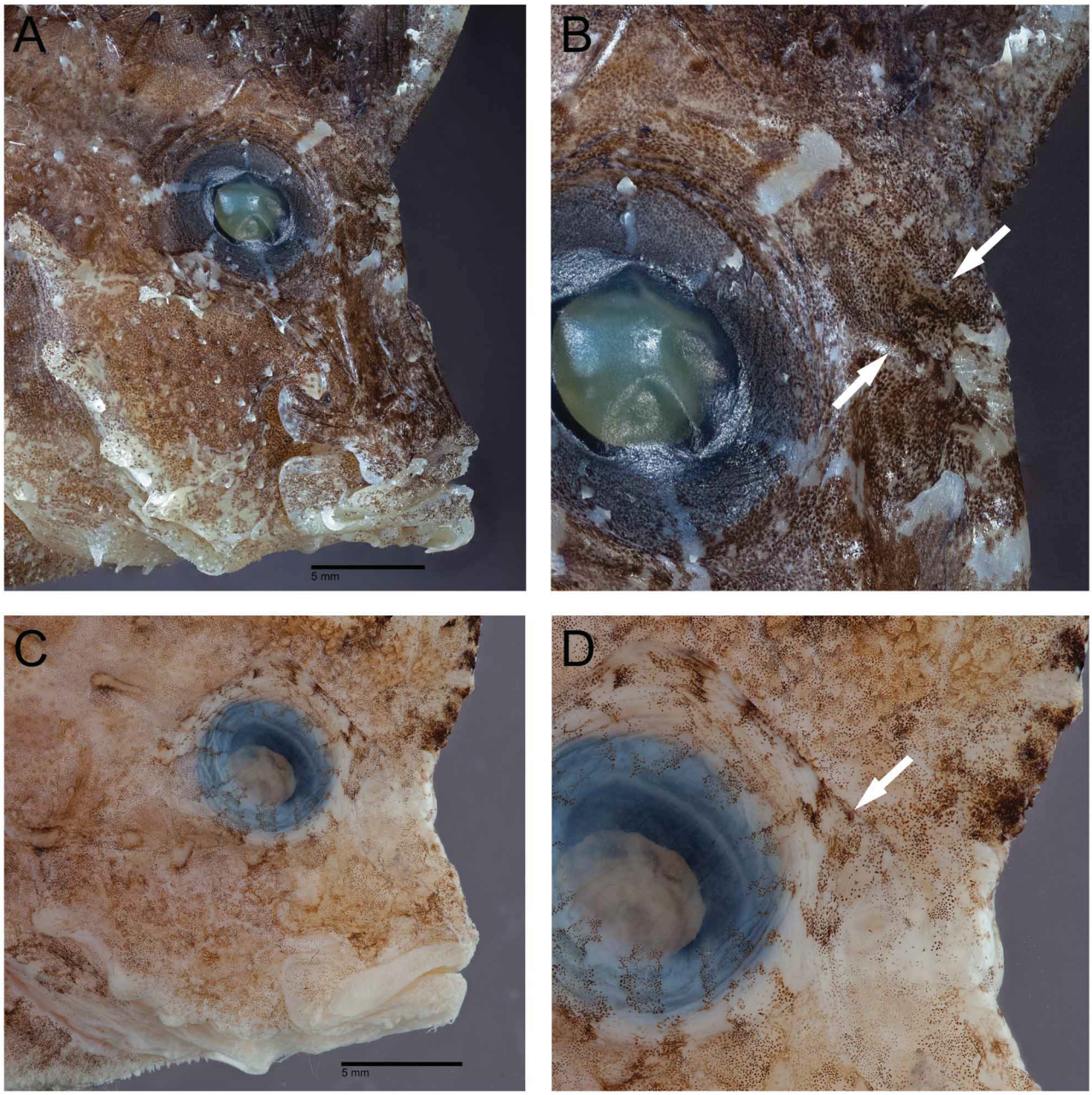

FIGURE 2. Lateral view of the forehead in *Pseudopataecus*. (A–B) *P. carnatobarbatus*, paratype, WAM P.33276-001, 84.5 mm (arrows indicate supraorbital and preocular ridges, with preocular pit between); (C–D) *P. taenianotus*, holotype, QM I.33192, 82 mm, (arrow indicates anterior end of non-prominent supraorbital ridge, note absence of preocular ridge and pit). Scale bar = 5 mm. (Photos: G. Thompson)

Fleshy, slightly raised pores at snout tip anterior to first lachrymal spine and at middle of lower margin of lachrymal, smaller pores along preopercular margin immediately below first to fourth preopercular spines. Preopercle with five blunt spines; the first large and prominent, others gradually decreasing in size ventrally; upper three projecting laterally and posterodorsally, fourth with low broad tip, fifth non-prominent or rudimentary; three lowermost spines armed with a poorly-branched or simple cirrus. Anterior edge of interopercle with two similar cirri. Operculum with two ridges; lower inclined slightly above the horizontal, terminating just prior to opercular margin; upper inclined about 45° to the horizontal, not reaching opercular margin; neither with spinous tips. Dorsal margin of operculum scalloped and steeply inclined dorsoposteriorly; opercular tip narrow, directed toward seventh

to eighth dorsal-fin spine. Sphenotic, pterotic, lower posttemporal and supracleithral spines forming similar to slightly larger blunt ridges. Cleithrum without spine. Ventral surface of lower jaw with numerous tufts of unbranched cirri, those anteriorly longest, up to almost pupil diameter in length. A pair of large pores close together just posterior to symphysis, pores also ventrally at middle and posterior end of dentary, those anteriorly and medially strongly obscured by cirri. Upper lip evenly papillose throughout; medial part of lower lip smooth, with a single row of tiny unbranched cirri along its upper margin, lateral and posterior parts more papillose than upper lip. Maxilla broad, smooth, with two small unbranched cirri posterodorsally and a much larger unbranched cirrus near lower margin adjacent to angle of mouth; rear margin of maxilla slightly curved, extending to a vertical midway between anterior edge of first dorsal-fin spine and anterior margin of eye. Both jaws with a broad uniform band of minute firm conical teeth. Similar small but well-developed teeth in a crescentic band on vomer, band projecting anteriorly and widest medially. No teeth on palatines. Tongue stout and rounded. Gill rakers short knobs, in holotype 2 on right side and 3 on left side upper limb, 6 on right side and 8 on left side lower limb, total 8 and 11 (0–4 + 5–8, total 6–11 in paratypes). Spacing of rakers somewhat irregular, often a short gap devoid of rakers below angle of arch. No slit behind posterior hemibranch. Branchiostegal membranes free from isthmus. Isthmus with fleshy extension anteriorly, slightly expanded, its free tip longer than wide.

Body markedly compressed, depth 2.8 (3.0–3.3) in SL, width 6.2 (6.3–7.9) in SL, densely covered with modified scales. Lateral line with 15 (13–17) tubes, gently sloping posteroventrally to the midlateral, then continuing in a generally straight course to the caudal base. Tubed scales mostly armed with a cirrus; last scale usually immediately preceding the caudal flexure. Dorsal fin originating about two-thirds of eye diameter before anterior margin of eye. First dorsal-fin spine longest, second only slightly shorter (second spine longest in all paratypes), third to seventh spines progressively decreasing in length, fourth to sixth abruptly so, eighth to last spines increasing gradually, or approximately equal in length. Dorsal-fin membrane not or very weakly incised. Last dorsal-fin ray adnate for most of its length by membrane to proximal third of upper caudal-fin ray. Twelfth (tenth to twelfth) dorsal-fin ray longest. Pectoral fin rounded, tips of rays protruding from membrane, fourth or fifth ray longest, reaching vertical between anus and first anal-fin spine. Pelvic fins relatively stout, 1.4 (1.4–1.6) in distance from their base to anus; with flexible spine and 3 rays; first soft ray shortest, second longest, third or innermost ray subequal to second; longest pelvic-fin ray subequal to fourth dorsal-fin spine; pelvic-fin membrane not adnate to body. Anal fin with single, moderately long, non-pungent spine; rays gradually increasing in length to seventh (seventh to ninth) ray, last two rays shorter; membranes distinctly incised; basal third of last ray connected to caudal peduncle by membrane. Caudal fin rounded, with 12 (ii6/6i) rays (11–13, i–ii6-7/5-6i–ii in paratypes); the latter protruding slightly from membrane. All fin rays with branched tips (except in juveniles). Vertebrae 31 (31–32).

Colour in alcohol. Head and body of holotype medium to dark grey-brown, with scattered diffuse pale mottlings. Head a slightly lighter shade of grey than body, with several vague dark striations radiating a short distance from eyes. Underside of head pale yellowish cream. Chest and belly pale grey. Anus pale yellowish cream. An irregular broad pale band across caudal peduncle. Dorsal, anal, caudal and pectoral fins charcoal-grey, scattered with small diffuse pale spots. Tips of all fin rays pale. Pelvic fins mostly pale, but with two transverse dusky blotches, the first about a third of fin length from base, the second slightly larger and situated just proximal to the tip. Several rows of pale spots forming a vertical vaguely T-shaped band across caudal fin at about one third length of fin. A broad pale semicircular blotch covering distal part of caudal fin from third to eighth rays, the area infused by more subtle dark mottlings. Shape of pale band and posterior blotch on caudal fin varying somewhat between holotype and some paratypes. Distal upper corner of caudal fin dusky to black, the pigment there more intense and contrastingly darker than remainder of fin.

Live colouration. Holotype almost entirely covered in thick greenish-brown mucosa. Side of body above midlength of pectoral fin with irregular whitish blotch, its lower edge intersected by lateral line. Area immediately surrounding eye lacking mucosa, the underlying skin tan, with numerous short irregular whitish striations radiating from eye. Dorsal, anal and caudal-fin tips vaguely pale. Caudal fin with irregular pale band across proximal third of fin and with wedge-shaped pale blotch distally in upper two-thirds of fin (Fig. 1A).

Most paratypes lacking a coating of thick pigmented mucosa. Colouration in the latter orange-red to dark reddish-brown on head, body and fins. An irregular light brownish-cream blotch situated above distal half of pectoral fins, and two adjacent off-white, mauve, or purple blotches on and just anterior to upper half of caudal peduncle. Ground colouration of head a lighter shade than body, vermiculated finely with numerous irregular whitish to pale pink markings. Tips of all fins whitish to dull pink. Distal upper corner of caudal fin and posterodorsal corner of soft dorsal fin dusky, contrastingly slightly darker than remainder of fins in most paratypes (Fig. 1B–C).

TABLE 1. Counts and proportional measurements of type specimens of *Pseudopataecus carnatobarbatus* and specimens of *Pseudopataecus taenianotus* (measurements as percentage of standard length).

Species	*P. carnatobarbatus*		*P. taenianotus*
Specimens examined	Holotype WAM P.33274-001	Paratypes (range) (n = 11)	Types & other material (range) (n = 15)
Standard length (mm)	97.4	36.1–84.5	74–118
Counts: Dorsal-fin rays	XIV/13	XIII–XIV/13–14	XIII–XV/14–15
Anal-fin rays	i/9	i/9–11	i/11–13
Pectoral-fin rays	11,11	11–12	11,11
Caudal-fin rays	12	11–13	12–13
Gill rakers	2+6=8; 3+8=11	0–4 + 5–8 = 6–11	0–2 + 4–6 = 4–7
Lateral-line tubes	15,15	13–17	11–16
Vertebrae (including urostyle)	31	31–32	31
Pelvic-fin rays	i/3	i/3	i/3
Measurements: Head length	34.8	32.9–36.6	30.6–32.4
Snout length	12.9	9.0–12.9	7.4–8.1
Orbit diameter	6.8	7.1–8.7	6.9–8.1
Interorbital width	7.2	7.1–8.0	7.4–8.3
Jaw length	10.1	9.2–11.2	9.3–10.5
Postorbital length	16.1	15.6–17.1	16.4–17.4
Body depth	35.3	29.6–33.7	33.3–36.3
Body width	16.0	12.5–15.8	14.4–15.7
Predorsal length	11.6	7.1–12.0	8.9–10.0
Dorsal-fin base (to last ray)	87.4	84.2–89.9	91.0–93.1
Anal-fin base	26.0	25.1–30.0	30.3–37.3
Caudal-fin length	29.7	28.9–32.0	26.7–30.7
Pectoral-fin length	31.5	29.6–34.3	31.3–34.1
Pelvic-fin length	21.4	18.8–22.1	15.3–19.3
first dorsal-fin spine length	29.6	27.0–31.2	26.7–32.3
second dorsal-fin spine length	29.0	27.6–31.7	31.2–34.1
third dorsal-fin spine length	25.9	24.7–28.5	28.8–32.7
fourth dorsal-fin spine length	20.7	18.0–22.1	24.4–27.7
fifth dorsal-fin spine length	15.6	14.0–16.5	20.1–22.7
penultimate dorsal-fin spine length	17.5	16.1–18.4	14.6–17.6
last dorsal-fin spine length	18.4	16.1–19.4	14.8–17.7
longest dorsal-fin ray	25.5	24.0–28.4	22.2–25.5
first anal-fin spine length	7.2	6.9–8.1	4.2–6.5
longest anal-fin ray	18.8	16.9–19.8	17.0–20.0
least depth of caudal peduncle	9.5	8.2–10.3	9.4–10.8

Etymology. The species is named *carnatobarbatus*, from the latin *carnatio* for fleshy and *barbatus* for bearded, in reference to the goatee-like beard of fleshy cirri present around the lower chin.

Distribution and habitat. Known from the types, collected from Monte Bello Islands (20º24'S 115º32'E), north to Adele Island (15º27.744'S 123º06.201'E) and west to Montgomery Reef (15º53.7'S 124º20.34'E), Western Australia, in depths of 0.1–9.0 m. The species is also recorded from Exmouth Navy Wharf (21°57'S 114°08'E) based on an underwater photograph taken by N. Marsh on 12 April 2006 in 13 m (Coleman 2006). Habitat where *P. carnobarbatus* was collected and observed mostly included broad shallow pools within degenerating low-relief reef, with dead coral heads, overhangs and crevices, scattered shell and coral rubble, most often among stands of brown macroalgae, especially *Padina* sp., but also *Sargassum* sp. All but two specimens were collected in very shallow water at low tide, however given the prevailing tidal range in the region, depths at the same locations would reach up to at least 12 m at spring high water.

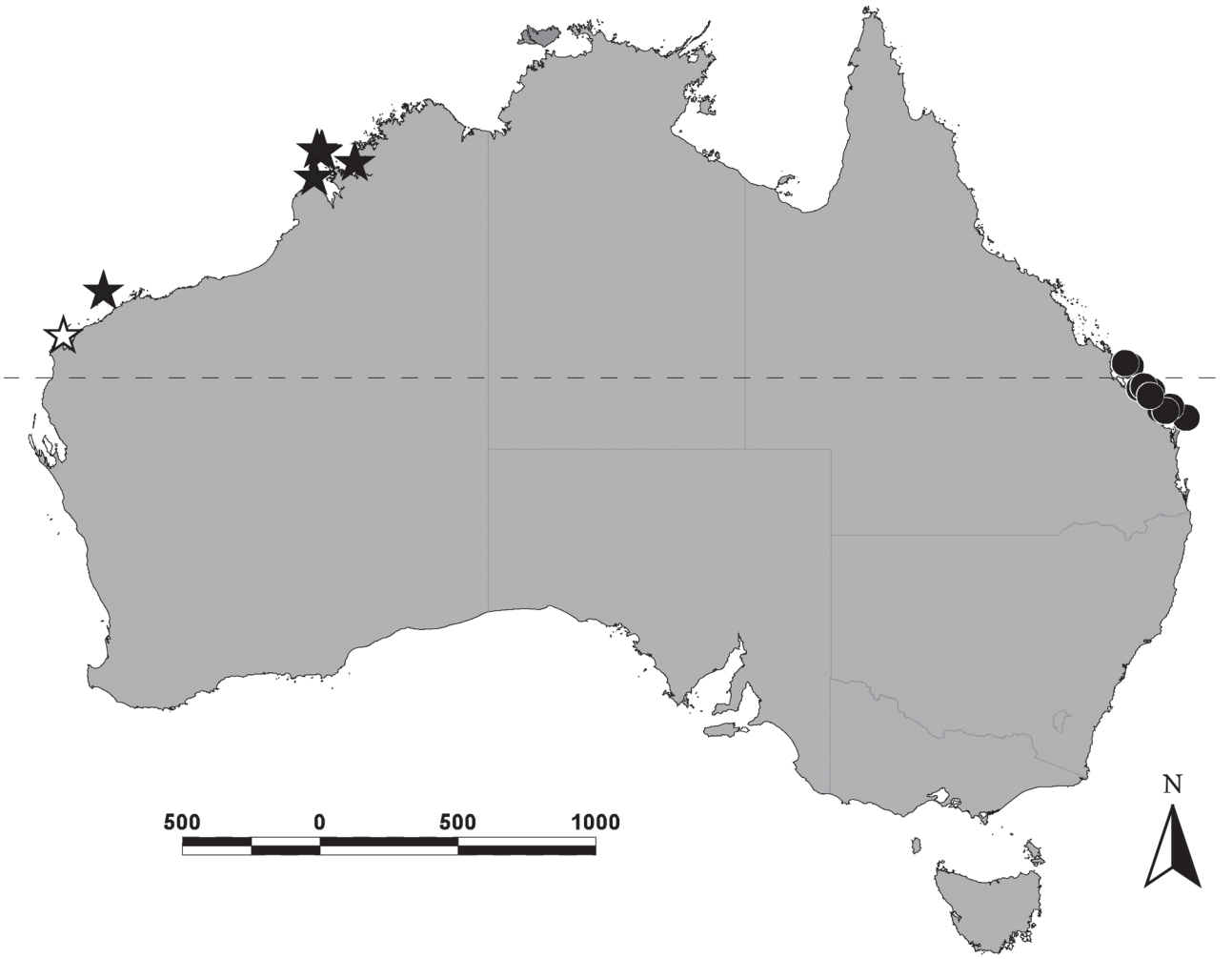

FIGURE 3. Distribution records for *Pseudopataecus carnatobarbatus* (stars) and *P. taenianotus* (dots) based on material examined and the site of an underwater photograph (open star).

Discussion. *Pseudopataecus carnatobarbatus* is distinguished from *P. taenianotus* by numerous characters, some of which are more fully outlined in the diagnosis. It has branched (versus simple) tips to most fin rays (except in juveniles, which have yet to develop branching); last soft dorsal-fin ray adnate for most of its length to proximal third of upper caudal-fin ray (versus joined to upper caudal-fin ray only at base); spinous dorsal fin more distinctly notched, making anterior portion of fin appear relatively more elevated; pelvic fins more robust, with third or innermost ray subequal to second ray (versus pelvic fins slender, third ray rudimentary and much the shortest); anterior face of lower lip smooth, with only a single row of tiny unbranched cirri along its upper margin (versus anterior face of lower lip profusely covered with numerous moderately large cirri); more prominent fleshy beard-

like cirri on ventral edge of chin; a relatively longer head and snout (HL 2.7–3.0 versus 3.1–3.3 in SL; snout 2.7–3.3 versus 3.9–4.2 in HL); a longer first anal-fin spine (6.9–8.1 versus 4.2–6.5% SL) (Table 1); and more prominent ridges on the frontal part of the cranium, including roughly parallel supraorbital and preocular ridges extending forward to meet the frontal ridge, forming a moderately deep quadrangular pit in the interspace (versus preocular ridge and quadrangular pit absent) (Fig. 2A–D). It also has modally fewer anal-fin rays (9–11, mode 10 versus 11–13, mode 12), and modally greater numbers of gill rakers (0–4 (mode 2) + 5–8 (mode 7), total 6–11 (mode 9) versus 0–2 (mode 1) + 4–6 (mode 5), total 4–7 (mode 6) (Table 2). The tufts of fleshy cirri on the lower edge of the chin are much produced in *P. carnatobarbatus* relative to *P. taenianotus*. In life *P. carnatobarbatus* was observed to collectively project the cirri ventrally or horizontally forward, in a tight goatee beard-like formation. In combination with the associated pores on the dentary, this would seem likely to perform a sensory function.

TABLE 2. Frequency of selected meristic values in *Pseudopataecus* specimens examined (# indicates counts for both sides are included; * denotes holotype).

Dorsal-fin Rays						
Species	Spines			Soft rays		
	XIII	XIV	XV	13	14	15
carnatobarbatus	1	11*	-	5*	7	-
taenianotus	2	12*	1	-	8*	7

Anal-fin Rays					
Species	9	10	11	12	13
carnatobarbatus	3*	6	3	-	-
taenianotus	-	-	4	10*	1

Lateral-line Tubes #							
Species	11	12	13	14	15	16	17
carnatobarbatus	-	-	1	13	9*	-	1
taenianotus	2	2	11	13*	1	1	-

Gill Rakers #																		
Species	Upper					Lower					Total							
	0	1	2	3	4	4	5	6	7	8	4	5	6	7	8	9	10	11
carnatobarbatus	1	10	9*	3*	1	-	4	6*	10	4*	-	-	4	1	7*	9	2	1*
taenianotus	10	19*	1	-	-	6	15*	9*	-	-	1	11	11*	7*	-	-	-	-

The new species is found in an extremely high tidal range area of Australia, where tidal movement of up to about 11 m occurs during spring tides. The species has only been collected in shallow tide pools at the bottom of the tidal range, mainly due to difficulties associated with making collections underwater in the prevailing high tidal flows of the region. It was found at sites that reach depths of up to about 12 m at high water, and was not observed at greater depths in the surrounding area during detailed underwater visual surveys. Most specimens were collected from among heavy cover in rocky pools including coral rubble and thick stands of brown macroalgae, especially including *Padina* species. In contrast, *P. taenianotus* is known from depths of 20–63 m and has only been taken by trawl or epibenthic sled, over predominantly soft bottom habitats, including algae and some sessile marine invertebrates, such as sponges.

Comparative materials. *Pseudopataecus taenianotus*: type and non-type material as listed by Johnson (2004); QM I.33946, 93.4 mm, NE of Burnett Heads, 24º 34'S 152º 34'E, 20–22 m, trawl, Qld Fisheries Service, 11 Oct 2002; QM I.37457, 118 mm, NE of Waddy Point, Fraser Island, 24º 54'S 153º 26'E, 29 m, trawl, Qld Fisheries Service, 27 Apr 2005; QM I.40074, 87.4 mm, East of Keppel Islands, 23º 05.1'S 151º 28.5'E, 40 m, epibenthic sled, Seabed Biodiversity Study Team, 3 Nov 2005.

Acknowledgments

Thanks are especially due to Sue Morrison of the Western Australian Museum, for help with collecting and scuba diving during the October 2009, Woodside Collection Project – Kimberley (Woodside 4) survey, and for photography, x-ray imaging, and curatorial assistance. Woodside Energy Limited and the Western Australian Museum are acknowledged for funding and co-ordination of the *Marine Life of the Kimberley Region* project surveys, which have been ably planned and led by Clay Bryce of the Western Australian Museum. I also thank various research colleagues and crew aboard the Kimberley Quest II for their co-operation and assistance during the survey. Gavin Dally of the Museum and Art Gallery of the Northern Territory kindly provided access to material from collections under his care. Alastair Graham of CSIRO Marine & Atmospheric Research, Hobart, provided collection data for uncatalogued CSIRO specimens of *P. taenianotus*. Geoff Thompson of Queensland Museum generated the close-up images used to illustrate the unique pattern of ridges on the head of the new species. Terrence Miller and Peter Davie of Queensland Museum are thanked for assistance with figures and plates. Two anonymous reviewers are thanked for their useful comments.

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